Bill Nye the Science Guy

Measurement

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Implementation Guide

Welcome to Disney's Bill Nye DVD collection! With the help of this Guide you can bring instructional DVDs into your math curriculum.

What's on the DVD?

Bill Nye DVDs expand the educational features of *Bill Nye the Science Guy* programs. Each DVD provides students with science content through video clips aligned with *Principle and Standards for School Mathematics (PSSM)* and a host of other resources.

Short video clips aligned with the (PSSM) provide a unique opportunity for you to enhance your lessons using DVD technology. Now you can show a video clip, or even short segments of a clip, on command. But there are a host of other features, too! See the chart below for a summary.

From the Main menu, there are three chief sections:

Feature	Description
Watch Program Menu	From this menu, you can play the program straight through or use the clips to customize your viewing.
Teacher Support	From this menu, you can access this Teacher's Guide, the Glossary, Internet Links, and the Quiz.
Bonus Materials	Use this menu to try a different discussion starter, download a special screen-saver, or check out never-before-seen footage.

From the Watch Program menu, you can:

Feature	Description
Play Program	Play the entire program from start to finish.
Bilingual Mode	View the entire program or clips in English or Spanish.
Glossary Mode	Make links to Glossary terms appear during the program.
Program Overview	View the program introduction, in which Bill discusses the topic covered.
Try This	Show students demonstrating science concepts.
Bill's Demonstration	Look at a demonstration conducted by Bill Nye.
Music Video	Enjoy a short music video that summarizes the topic in an age-appropriate and entertaining manner.
Math Standards	Take advantage of short video clips from the program, which are aligned with Principles and Standards for School Mathematics.

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From the Teacher Support menu, you can:

Feature	Description
Quiz	Give students a quiz to take independently or as a class. Ten quiz items are aligned with national standards. The items are in multiple-choice or true-false format. Each wrong answer links to a standards-aligned video clip. At the end of the quiz, a scoring function reveals the number of correct initial answers.
Glossary	Check out definitions of key terms and view video clips that reinforce the concepts.
DVD Features	View a quick overview of the features found on the DVD.
Teacher's Guide	Print out or view this comprehensive Teacher's Guide in PDF format.
Internet Link	Link to the Bill Nye area of Disney's Edustation Web site, where you can find links to Internet sites related to the content of each Bill Nye program.

From the Bonus Materials menu, you can:

Feature	Description
Bonus Material	Find out what *wasn't* in the episode! In most cases, there's more of the Way Cool Scientist interview, Bill Nye outtakes, and an extra discussion starter.
Additional Clips	See trailers of related DVDs and videos.
Screen-Saver	Download this cool screen-saver for your computer.

The Planning Process

This Guide provides a Lesson Planning Worksheet (see page 15), which can assist you in setting up your instruction around a topic. The following sections of this Implementation Guide are offered to assist your planning process:

- **Determining Objectives and Linking to Standards**
- **The Learning Cycle**
  - **Explore**
  - **Apply**
  - **Extend**
  - **Assess**

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Determining Objectives and Linking to Standards

1. Select content and adapt and design activities to meet student interest. The PSSM Teaching Principle states that "Selecting and using suitable curricular materials, using appropriate instructional tools and techniques…are actions good teachers take everyday." The Principle goes on to state that, "Teaching mathematics well involves creating, enriching, maintaining, and adapting instruction to move toward mathematical goals, capture and sustain interest, and engage students in building mathematical understanding." The Bill Nye DVD provides good mathematical content in a fun and engaging way for students of all ages.

   Each DVD contains a menu of clips that are Math aligned with PSSM. You can review the standards and their aligned clips in the Standards menu under Watch Program. Also, the Standards listed on page 10 of this Guide allow you to look at additional PSSM content standards that are addressed on the video. Since most state and local standards documents were derived from the PSSM, you will find that your local and state standards match closely with content standards in the Bill Nye DVD. Here's an example of the content standards and clips aligned with the Bill Nye DVD entitled *Measurement*:

Mathematics Standards (PSSM) Addressed in Measurement

Measurement:
Understand measurable attributes of objects and the units, systems, and processes of measurement

- **Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems.**

  Aligned clips:

  - **1 Great moments in measurement**
  - **2 A meter is a meter wherever you are**

- **Understand relationships among units and convert from one unit to another within the system.**

  Aligned clips:

  - **3 A meter to a liter to a kilogram**
  - **4 Meter/centimeter/millimeter/micrometer**

  Apply appropriate techniques, tools, and formulas to determine measurements.

- **Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.**

  Aligned clips:

  - **6 Construction and airplane manufacturing**
  - **7 Bridge**

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2. Determine your objectives for the lesson and how these objectives address the standards.

Sample Objectives for *Measurement*

In this activity students will:

- **Compare the origin of the metric system with the customary system.**
- **Distinguish between standard and nonstandard measurements.**
- **Explain how meters, liters, and kilograms are related.**
- **Define the metric prefixes as based on powers of ten.**
- **Convert from one unit to another within the metric system.**
- **Measure length, volume, and mass of common objects using appropriate units.**

3. Design a learning cycle of instructional experiences and assessments for the students to engage in that will help students meet these standards. Students may be given teacher-planned investigations or may be guided to design their own investigations.

The Learning Cycle

The learning cycle is a sequence of activities that involve students in the learning process. The sequence found here is based on research from Lawson**,** Abraham, and Renner published in 1989. That has been adapted to include: Explore, Apply, Extend and Assess:

Explore: Involves assessing students' prior knowledge and providing opportunities for students to interact with content from the video.

Apply: Includes having students use the content learned during the Explore section in a new way that is meaningful to future learning.

Extend: Allows students to conduct further research around an area of interest within the topic.

Assess: Provides strategies meant to inform students and teachers about the content and processes that have been learned.

Explore

The PSSM Teaching Principle states that, "Effective teaching requires a challenging and supportive classroom learning environment." In an ideal mathematical setting, students are able to think, ask questions, solve problems, and discuss solutions with their fellow classmates and the teacher. Teachers should provide students with worthwhile mathematical tasks in a way that is intriguing to all and challenging for students with different levels of ability. Mathematics teachers need to make decisions about when and how to provide information, and "how to support students without taking over the process of thinking for them." Knowing the best time to intervene is often determined by allowing students to ask questions and to explore concepts openly.

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Assess in Order to Guide Teaching: The Program Overview or the Discussion Starter on the DVD can be used to gauge students' prior knowledge. You can use student responses to make decisions about appropriate instruction and adaptations in order to meet the needs of individual students. Assessment can be in the form of student reflections from standards-aligned video clips or answers to questions found on the science quiz. Or, as in the following example, a simple graphic organizer can facilitate a formative assessment.

Example: Graphic Organizer (page 17) from *Measurement*

1. Explain to students that as they watch clips of the Bill Nye DVD Measurement, they will be filling in a graphic organizer. Begin by having the student place a circle in the middle of a piece of paper with the phrase "metric system" in it. The circle should have two or three "spokes" coming out of it.

2. Explain to students that as they watch a clip, they should display information on the wheel in a way that makes sense to them .

3. Students can then color code their graphic organizer so that one color represents what they already know about the metric system (e.g., meter, liter, gram, etc.) and another color represents new things they have learned from watching the video clip (e.g., how a meter was first determined, etc.) Replay the clip as necessary to allow students to review sections of interest.

4. Once students have completed their graphic organizers, ask them to share what they coded as "new" information. Write these on the board. Have students write their own "working" definition of the metric system. Once students have completed their definitions, collect and review their work to assess prior knowledge.

Conduct direct vocabulary instruction in the Explore phase. Research suggests that:

- Students must encounter words in context more than once to learn them.
- Instruction in new words enhances learning those words in context.
- One of the best ways to learn a new word is to associate an image with it.
- Direct vocabulary instruction on words that are critical to new content produces the most powerful learning.

Use the DVD Glossary with the linked video clips to expose students to new vocabulary words in context, along with associated video images. You can also find a printed version of the glossary terms in this Guide on page 20.

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Example: Using the Glossary for Direct Vocabulary Instruction
Measurement

1. Present students with a brief explanation or description of the new term or phrase from the glossary. For example: "Hodometer: a measuring wheel that was an instrument used in ancient Rome to measure distance traveled or mileage."
2. Present students with a nonlinguistic representation of the new term or phrase. Show the video clip associated with the term "hodometer."
3. Ask students to generate their own verbal description of "hodometer."
4. Ask students to create their own nonlinguistic representation of "hodometer."
5. Periodically ask students to review the accuracy of their explanations and representations.

Apply

"In planning individual lessons," the PSSM Curriculum Principle states that "teachers should strive to organize the mathematics so that fundamental ideas form an integrated whole. Big ideas encountered in a variety of contexts should be established carefully, with important elements such as terminology, definitions, notations, concepts and skills emerging in the process." Based on the information that you gained from the Explore assessments, design appropriate activities for your students. Check the experiments listed in the Episode Guide (see page 11) for explanations of the demonstration from the Bill Nye program as well as for additional experiments designed to help apply the knowledge gained.

In the following example from Measurement the standards based video clips are used to provide background information to the students.

Example: Understanding Relationships Among Units

1. Have students begin a graphic organizer with the word "Unit" in the circle, focusing on what they already know about units of measurement.
2. Watch the following chapters from the Bill Nye DVD *Measurement:*
   - A meter to a liter to a kilogram
   - Meter/centimeter/millimeter/micrometer
3. Complete the graphic organizer with new information from the clips.
4. Give students copies of the Student Problem Solving Sheet (see page 18) and have them fill the sheet out as they conduct their activities.
5. Do the activities entitled "What's a Centimeter on You?" and "How Much Can it Hold?" from the Measurement Episode Guide.
6. Write down any remaining questions that students have about units of measurements.

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Extend

Identify and Use Resources Outside of the School: "The school program must extend beyond the walls of the school." Each Bill Nye DVD contains resources designed to facilitate such understanding, including:

- Way Cool Scientist, found in both Watch Program and Bonus Materials, in which scientists discuss their current areas of study. This real-world connection often results in a deeper student understanding of a particular career.
- Disney's Edustation Web site, where relevant Internet links provide a starting point for students to further explore topics.
- Try these video clips, with activities parents and students can do at home. The questions generated by students from these experiences can be used as foundations from which they may conduct their own research.
- Standards-aligned video clips and Bill's demonstration video clips, which can help generate topics for further research. After viewing the clips, have students list their questions, perhaps about the most current developments in a topic. By conducting online or library research, students will find answers to their questions and will learn about a topic in greater depth.

"Problem solving is central to inquiry and application and should be interwoven throughout the mathematics curriculum to provide a context for learning and applying mathematical ideas" (NCTM, 2000). Challenging problems should be based on student interests and abilities so they explore mathematical concepts that are relevant to their lives. In the following example, students use measurement skills to solve a real life problem of local interest.

Example: Example: How Long Does it Take to Get Across My State?

Pose the question above to your students. Explain that their job will be to deterime how long it would take to traverse their state using a chosen mode of transportation. Students may choose from a variety of modes including, "walking", "skateboarding", or "riding a bike." Ask students for ideas of how to solve this problem without actually "going the distance."

Depending on their travel mode choice, students can use a stopwatch and a tape measure to determine the average speed they might go using their chosen mode. (This might need to be done as a homework assignment.) Using a map students should determine the route across the state they would like to take. Allow students to use many different routes. To vary the distances, suggest that students work with a state where they were born, or where they have once lived. Alternatively, students could expand this assignment to entire countries. Or the title could be changed to "How long does it take to get out of my state from my hometown?" for a real local context.

Once students have determined the time it would take to cross the state using their chosen mode, ask them to reconsider their answer and make it more realistic by adding time for sleep, rest, eating, etc. Instruct students to provide a rationale for these additions on the Student Problem Solving Sheet (page 18).

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Assess

Once students have solved the problem, you may choose to assess them in a number of different ways:

- By having students write about what they learned in a journal.
- By having students submit projects or reports.
- By having students take the program quiz to gauge their understanding of certain facts in the video. You can either print the quiz (found in this Guide on page 22) and have each student complete it individually or use the DVD screen version and the scoring feature for whole-class assessment.
- By designing other standards-aligned questions to augment those that are provided.

While the quiz will provide you with information about what the students have learned, it does not assess how students have processed the information. Below you will find assessment ideas that can be used to measure both content and process.

A Sample Assessment

1. Explain to students that an important aspect of mathematics is communication. Tell students that they will write a short report on their problem from (How Long Does it Take to Get Across My State?) including:
   - The state and mode of transportation you chose including illustrations
   - The method that was used to find solutions to the problem
   - Mathematical calculations for solving the problem
   - Solution(s) to the problem
   - Additions to your solution to make it more realistic
   - Rationale for these additions
2. Distribute the rubric found in the Lesson Planning Worksheet (see page 15) to students so they know how they will be assessed. Make sure that students understand the criteria found in the rubric. Before you begin you may want to allow students to make changes to the rubric so that it is more clear or makes more sense from the their perspectives.

Allow students time to prepare their report. As students complete the report, walk around the room and ask questions to assess their progress and provide input as needed.

Congratulations! You have now completed the steps to set up a lesson plan using the Lesson Planning Worksheet. You have also explored many of the features of the Bill Nye DVD as well as the supplemental information found in this Teacher's Guide. And most important, you've made significant strides toward incorporating DVD technology into your day-to-day instruction.

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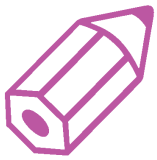
Principles and Standards for School Mathematics (NCTM)

Measurement

Standards/Benchmarks



Geometry Standard

Use visualization, spatial reasoning, and geometric modeling to solve problems

- Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life.

Measurement Standard

Understand measurable attributes of objects and the units, systems, and processes of measurement

- Understand both metric and customary systems of measurement;
- Understand relationships among units and convert from one unit to another within the same system;
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.
- Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems (3-5)

Apply appropriate techniques, tools, and formulas to determine measurements

- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision;
- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles

Problem Solving Standard

- Monitor and reflect on the process of mathematical problem solving.

Connections Standard

- Recognize and use connections among mathematical ideas;
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- Recognize and apply mathematics in contexts outside of mathematics.

Representation Standard

- Use representations to model and interpret physical, social, and mathematical phenomena.

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Episode Guide

Measurement

Synopsis

In *Bill Nye the Science Guy: Measurement*, Bill Nye teaches about the function and use of standardized measurements. He discusses the origins of standard weights and measures, as well as their significance. Bill examines the importance of making precise measurements and demonstrates various methods of measuring objects.

Objectives

The student will:

- understand the importance of standard measurement and name several tools for measuring in standard units
- explore the origin of standard measurements
- become acquainted with the relationship between units of length, area, volume, and mass

Background Information

Developing a Meter

In early times, people in different countries used different units to measure the world around them. In 1791, the French Academy of Science took on the task of developing a standard unit of measure that had a logical connection between the units within it. The Academy based its system on 1/10,000,000 of the distance between the North Pole and the equator. By 1797, the meter was redefined slightly and could be compared to 39.37008 inches. Later, a platinum bar measuring exactly 1 meter was placed in the French Archives to be used as the standard for the common meter.

The Celsius Scale

In the 1740s, astronomer Anders Celsius experimented with developing a scale to measure temperature. Originally, his scale placed the boiling point of water at 0 degrees and the melting point of ice or snow at 100 degrees. After Celsius' death, the scale was reversed, placing the boiling point at 100 degrees and the melting point at 0 degrees.

Preview Questions

- Why is it necessary to measure things? What do we measure?
- What does it mean to be standard?
- Why are exact measurements necessary?
- When is an estimate good enough?
- What are three units of measure in the metric system?
- How are length, area, mass, and volume related?

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Postviewing Questions

- Explain why you think the metric system is easier or harder to use than our system of inches and feet, quarts and gallons, ounces and pounds.
- How was the length of a meter determined?
- How do centimeters and millimeters relate to a meter?
- How does Anders Celsius' thermometer work?
- How is his scale related to the metric system?
- Why do units of measure need to be standardized? Describe a problem that could occur if they were not standard.
- What are three devices used for measuring?
- What unit does each use?
- Describe the relationship between meters, liters, and kilograms.

Suggested Activities

1. Inches vs. Centimeters

Use this activity to compare the difference in size between inches and centimeters. Allow younger students to simply list the results. Have older students check to see that conversion factors really work by converting their measurements from one unit to another.

Identify several items around the classroom and list them for the students. Break the class into small groups and have the groups rotate to the different items, measuring them first in inches, then in centimeters. After each group has measured all of the items, have groups compare their results with one another. If the results vary slightly, discuss what might cause the differences. How much of a margin of error is acceptable? Discuss which units were easier to use for measuring. Was it easier to measure in eighths and quarters (inches), or in tenths (centimeters)? Have older students convert centimeters to inches by multiplying by 2.54 to see if their own measurements agree.

2. Measuring Here, There, and Everywhere

In the United States, we often measure in inches, yards, and pounds. In England, they use centimeters, meters, and grams. Divide students into groups to research the systems that people in other countries use for measuring, today as well as in the past.

How long ago was the system developed? Upon what was it based? Is it still used today?

Have students make posters illustrating the measuring systems; display them in the classroom or school hallway. Have each group organize a presentation that could include descriptions of the systems, as well as comparisons to more common units of measure.

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3. What's a Centimeter on You?

The foot developed as a unit of measure, because people would walk next to something that needed to be measured, counting their steps as they went. In this way, they could measure an item without using any tools.

Have students create their own measuring systems using body parts. Let each student determine which of their body parts most closely equals a centimeter, a decimeter, and a foot. Allow students to measure various items in the classroom using their body parts. As an extension activity, ask students to explain their system to someone at home and have that person determine how to use their own body to measure centimeters, decimeters, and meters.

4. How Much Can It Hold?

Use this activity to reinforce the relationship between length, area, and volume.

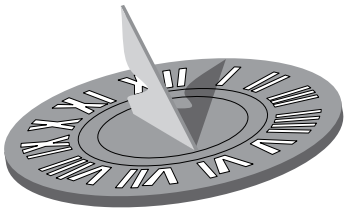
Have students bring in various food boxes from home. Boxes from cereal, granola bars, and graham crackers should work well. Divide the class into small groups and give each group several boxes, as well as plastic bags, rulers, and water in graduated cylinders. Groups can find the volume of each box by multiplying length times width times height. Then have them line the boxes with the plastic bags and pour in the water. Let them measure how much water they pour in and compare that to the volume that they calculated for each box. Finally, students should try to find boxes of different shapes that hold the same volume. If you have access to scales, students can also find the mass of the water that each box held. In this way, they can see how mass relates to volume and area.

5. Making Time Flow!

Long before digital watches were invented, people had devised ingenious ways to tell time. The sundial, water clock, and hourglass are a few examples.

Students can work in teams of two to four to make their own sand timers. Each team will need:

- 2 plastic soda bottles; ones that are narrow on top and wide on the bottom work the best
- modeling clay or play dough
- narrow plastic drinking straw or plastic tube
- narrow sharpened pencil no wider than the straw
- duct tape or masking tape
- 1 cup of fine sand



Be sure the bottles are dry. Measure the combined length of the two bottlenecks. Cut a straw that is about 1/8 to 1/4 inch longer than the combined length. Fill one bottle half full with fine sand.

Pack modeling clay or play dough into both of the bottlenecks. With a narrow pencil, pierce a hole in the middle of the modeling clay of both bottles and insert the straw or plastic tube in one bottle first. Make the straw or tube as flush with the bottom of the modeling clay as you possibly can, but it has to go through the modeling clay. Lay both bottles on their side and insert the straw into the hole in modeling clay of the other bottle. Tape the bottles together with duct tape or masking tape. Stand the bottles upright, with the bottle containing the sand on top. How long does it take for all the sand to flow from the top bottle to the bottom one? That length of time is affected by the shape of the bottle and the size of the straw's diameter. Compare the length of time with what other teams recorded.

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6. You Say Fahrenheit,

I Say Celsius

Celsius and Fahrenheit are the most commonly used thermometers, Fahrenheit in the U.S. and Celsius in Europe. Water freezes at +32°F and 0°C, the human body temperature is 98.6°F and 37°C. The temperature 40° is the same on both thermometers. Have the students use this information to figure out the day's temperature in Celsius after finding out the day's temperature in Fahrenheit. Then, have them calculate a formula for converting from Fahrenheit to Celsius. Challenge them to calculate a formula for converting from Celsius to Fahrenheit.

(Fahrenheit to Celsius: Subtract 32 from the temperature and multiply the difference by 5/9.)

(Celsius to Fahrenheit: Multiply the temperature by 9/5 and add 32.)

7. What Units Would You Use?

Ask students to work in small groups to create their own measuring systems. Allow them to choose objects that are standard in their own lives. For instance, they could use a paper clip, a new pencil, and a math book for their units. After the groups have chosen their units, have them measure objects around the room. A window may be 3 math books and 4 paper clips long. Then have the groups switch units and measure the same objects. Have older students try to determine conversion formulas for the units.

Bibliography

Books

Asimov, Isaac. *Realm of Measure*. Houghton Mifflin, 1960.

Corwin, Rebecca B. and Susan Jo Russell. *Used Numbers, Measuring: From Paces to Feet.* Dale Seymour Publications, 1990.

Dolan, Edward F. *The Old Farmer's Almanac Book of Weather Lore*. Yankee Books, 1988.

Joseph, George GheverGhese. *The Crest of the Peacock: Non-European Roots of Mathematics*. Penguin Books, 1991.

Multiculturalism in Mathematics, Science, and Technology. Addison-Wesley, 1993.

Schwartz, David M. *How Much Is a Million*? William Morrow & Co., 1985.

Internet Resources

Metric Conversions
http://www.ur.ru/~sg/trans!/

This site lists many common conversion factors and some that are not so common.

Conversion Calculator
http://www.worldwidemetric.com/metcal.htm

This site contains a conversion calculator that allows you to plug in a measurement of length, weight, pressure, or volume and have it automatically converted into another unit of measure.

US Metric Association
http://lamar.colostate.edu/~hillger/

The Metric Association web site offers, among other things, examples of metric usage, conversion factors, examples of why metric is best, and temperature conversions.

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Bill Nye the Science Guy

Lesson Planning Worksheet

Lesson Title _____

Objectives _____

_____

_____

Estimated Time Required _____

Materials Needed _____

_____

Principles and Standards for School Mathematics

_____

_____

_____

_____

_____

Explore _____

_____

_____

_____

Apply _____

_____

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_____

Extend _____

_____

_____

_____

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Assess

As presentations are made, assess the quality of the student's work as thoroughly and as equitably as you possibly can. The following criteria can be used to assist in your assessment.

Name of Student _____

Question Investigated _____

Methods and Calculations for Finding Solutions			
1 Students do not report methods or calculations.	2 Students report methods or calculations but they are vague and incomplete.	3 Students report methods and calculations for solving the problem that are mostly complete.	4 Students report methods that are accurate and complete.
Solutions and Rationale			
1 Solutions are undefined. Rationale is not included.	2 Student solutions are incomplete and do not adequately answer the problem. Rationales are inaccurate.	3 Student solutions are complete and adequately answer the problem but rationale for additions are incomplete.	4 Student solutions are complete and include several detailed rationale for additions of time.
Illustrations			
1 Illustrations are not included.	2 Illustrations are adequate but do not connect well with the problem and solution.	3 Illustrations are integral to the problem and solution.	4 Illustrations are exceptional and visually engaging.

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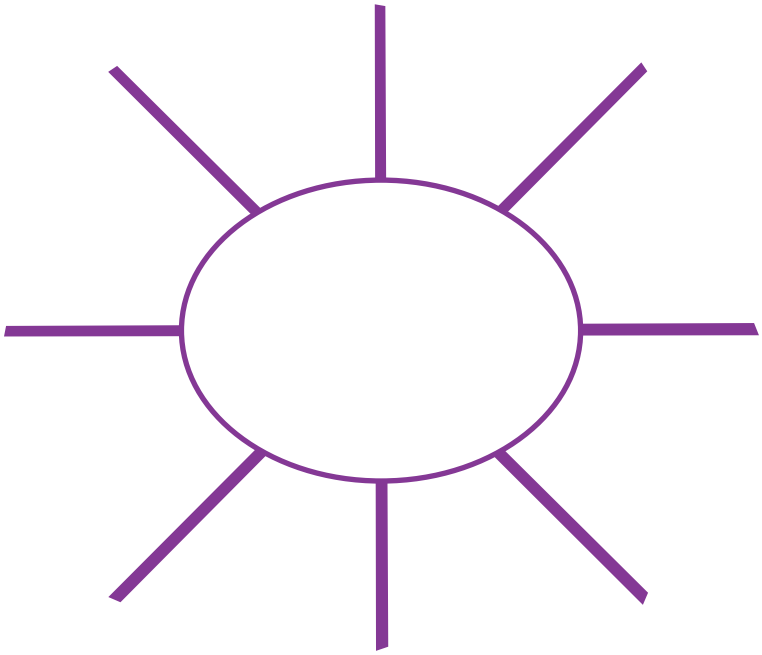
Graphic Organizer

As you watch the Bill Nye clip, write down the main idea in the center of the circle. As supporting ideas are presented write additional words or phrases on the spokes.



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Student Problem Solving Sheet

Problem Title: _____

Problem: _____

_____

_____

Method: (How you plan to solve the problem)

_____

_____

_____

_____

_____

_____

Calculations: (Solve the problem, show your work)

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Illutstrations: (draw a picture)

What have you learned?:

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Glossary

Measurement

Fold and cut to use as flashcards.

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METER

Meter

A meter is the basic unit of length in the metric system. Originally, the meter was based on 1/10,000,000 of the distance between the North Pole to the equator. Later, the system was redefined, and the meter represented the distance traveled at the speed of light in one second

Bill Nye the Science Guy

METRIC SYSTEM

Metric system

The metric system or SI is a system for measuring mass (using the kilogram as the basic unit) and measuring length (using the meter as the basic unit). Based on the number 10, the system was developed to fulfill the need for a standard international unit of measurement.

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AREA

Area

Area measures the amount of surface within any enclosed, 2-dimensional shape and refers to the number of square units (for example, meters, feet, miles, etc.) needed to cover a particular surface.

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VOLUME

Volume

Volume measures the amount of space occupied by a 3-dimensional object measured in cubic units of length (meters) or cubic units of capacity (liters).

© Disney

Fold and cut to use as flashcards.

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LITER

Liter

A liter is a standard metric unit of capacity or volume that usually measures the amount of a liquid. One milliliter (0.001 liter) of water is equal to one cubic centimeter.

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HODOMETER

Hodometer

A hodometer or a measuring wheel was an instrument used in ancient Rome to measure distance traveled or mileage.

Bill Nye the Science Guy

CELSIUS SCALE (C)

Celsius Scale (C)

Developed by Anders Celsius, this metric temperature scale is based on the temperature at which water freezes (0°C) and ranges to the temperature at which water boils (100°C), given a standard atmospheric pressure.

Bill Nye the Science Guy

THERMOMETER

Thermometer

A thermometer is an instrument used to measure temperature. Often made of glass, a thermometer contains a liquid (such as mercury or colored alcohol) that expands when heated and contracts when cooled.

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Name _____ Date _____

Quiz

Measurement

True or False? Circle T or F

1. One measurement will tell us all we want to know about what we are investigating. T or F
2. Measurements made by hand are more accurate than those made by machine. T or F
3. The meter is a standard unit of measurement. T or F
4. Parts like light bulbs and batteries fit in appliances because they are measured. T or F
5. Temperature can be measured in degrees Celsius. T or F
6. When you measure a square in two directions, you are measuring volume. T or F

Multiple Choice: Circle the letter of the best answer

7. How many centimeters are in 1 meter?
   - A. 10
   - B. 100
   - C. 1,000
   - D. 1 million

8. How much does a liter of water weigh?
   - A. Kilogram
   - B. Gram
   - C. Ounce
   - D. Meter

9. Which of the following is not one of the things we measure most?
   - A. Location
   - B. Length
   - C. Time
   - D. Mass

10. What could you measure with a hodometer?
    - A. Temperature
    - B. Length
    - C. Weight
    - D. All of the above

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Answer Key

Measurement

1. F	4. T	7. B	9. A
2. F	5. T	8. A	10. B
3. T	6. F		

HODOMETER

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